

Physiology and Biophysics Department

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Degrees Awarded

Ph.D. in Physiology and Biophysics; M.S. in Biomedical Sciences (Physiology and Biophysics Track)

Web Site

<https://medicine.stonybrookmedicine.edu/pnb>

Application

https://app.applyyourself.com/AYApplicantLogin/fl_ApplicantLogin.asp?id=sunysb-gs

Physiology and Biophysics Department

The Department of Physiology and Biophysics offers a program of study leading to the degree of Doctor of Philosophy. The broad interests of our faculty provide diverse research opportunities ranging from systems physiology, to translational cancer research and single molecule biophysics. Our goal is to instruct students in the use of quantitative methods to study complex physiological problems of relevance to human health and disease.

The Department's principal areas of research specialization are 1) Ion channel and gap junction Biophysics, with emphasis on cardiology and vision; 2) Intracellular and intercellular signaling mechanisms in cancer and neurobiology; 3) Physiology at the cellular, organ, and intact animal levels with emphasis on transgenic models of disease; 4) Fluorescence microscopy with the largest concentrations of microscopy equipment at Stony Brook University.

Our curriculum is based on a foundation in Human Physiology with additional advanced courses in Statistical Methods, Biochemistry and the physical chemistry of Biomembranes. Through elective coursework in Applied Mathematics, Genetics, Neurobiology or Journalism students can tailor their training to their career goals. Students from our program have gone on to careers in academic and industrial research, government service and law.

Master of Science Degree in Biomedical Sciences, Physiology and Biophysics Track

Goals of the Program

The overall goals of the Master of Science degree program in Biomedical Sciences (Physiology and Biophysics track) are to provide students with a biomedical foundation towards their higher professional education or career goals in medicine and research. We seek to ready our students for entry and success into medical and dental programs, as well as positions of research staff scientist in laboratories and industry, a teaching career at the undergraduate college level, or further graduate study leading to the Ph.D. degree. To accomplish these goals, the program of study provides training in cellular and systems-level physiology, membrane biophysics, experimental design, data analysis, and commonly used laboratory techniques in integrative physiology. We provide a heavy emphasis on pathophysiology and clinical case-based learning. Elective coursework in Physiology and Biophysics, Biomedical Engineering, Neuroscience, Molecular and Cellular Biology, and Pharmacological Sciences are then selected to complement and expand on the above core training, and meet the individual needs of each student.

Time

All requirements must be completed within three years.

Admission requirements of Physiology and Biophysics Department

The minimum requirements for admission to The Ph.D program in Physiology & Biophysics are a Bachelor's Degree with a Major in the Physical or Biological sciences. Successful applicants have a grade point average of 3.25/4.0 or higher for their undergraduate curriculum, with special emphasis on coursework within the major. Admission requires submission of scores from the Graduate Record Exam (GRE). Successful applicants have GRE scores ranked in the upper half in all three areas of examination. No subject test is required. Students for whom English is not their native language, must establish English proficiency based on the results of your TOEFL or IELTS examinations. Applicants are required to provide three letters of recommendation that can speak to the student's academic and research performance. Preference is given to students with previous research experience. Students who do not meet these qualifications are encouraged to seek admission to our Master's program for additional preparation.

Facilities of Physiology and Biophysics Department

In addition to the wide range of instrumentation and technical centers available on campus, the Department of Physiology and Biophysics is well equipped with major research instrumentation for physiological, metabolic, and biochemical studies. The department houses a Molecular Biology Core which has scintillation counters, ultracentrifuges, amino acid analyzers, protein sequencers, and a wide variety of chromatographic, electrophoretic, and spectrophotometric equipment. Also available are a peptide synthesizer, and a laboratory for chemical synthesis of low-molecular-weight compounds. NMR instrumentation is available through collaboration with other departments. Tissue culture services, including monoclonal antibody production, are also available. Specialized equipment used in studies of membrane physiology and biophysics (e.g., membrane electrophysiology and patch-clamp studies on ion channels) are in routine use in several faculty laboratories. The department also houses an imaging center containing two confocal microscopes with image acquisition and processing systems.

Molecular Biology Core

The molecular biology core was established to provide students and faculty ready access to DNA/RNA recombinant technology. Departmental facilities include a 37-degree environmental room, a DNA synthesizer, and an automatic DNA sequencer, large orbital shakers, an array of incubators, DNA sequencing gel set ups (IBI), electrophoretic apparatus and power supplies, an IBI gel reader and a software package which permits the reading of DNA sequencing gels, a selection of restriction enzymes, and a number of cDNA expression libraries.

Molecular Modeling

Computational molecular modeling and visualization are valuable tools for the study of signal transduction systems and protein structure/function. Some current applications of faculty affiliated with our Biophysics Program include examining the physical factors involved in protein/membrane, protein/protein, protein/DNA interactions, studying the specificity of ligand and substrate binding to enzymes, and building models of proteins using domain structures from homologous proteins. Several departmental members have access to the University's Supercomputing Center.

Computing Facilities

Access to the campus-wide wireless network is available.. All computers are connected via Ethernet to a local area network.

Requirements for the Ph.D. Degree in Physiology and Biophysics

In addition to the minimum Graduate School requirements, the following are required:

- A) Completion of HBY 531 or HBY 501, HBY 530, HBY 561 HBY 562, MCB 517, MCB 520, HBY 570, HBY 591, HBY 690, HBY 699, HBY 695, and 12 credits of elective courses.
- B) Satisfactory completion of the preliminary examination at the end of the second year of study.
- C) Submission of a thesis research proposal by the end of the third year.
- D) Participation in the teaching practicum.
- E) Submission of an approved dissertation and successful oral defense.
- F) Completion of all requirements within seven years.

Requirements for the MS in Biomedical Science (Physiology and Biophysics track)

Two curriculum tracks exist for the M.S. Program in Biomedical Sciences (Physiology and Biophysics concentration). A total of at least 30 credits is required for the standard thesis M.S. degree, while 36 credits is required for the research track M.S. degree. Regardless of the track chosen, all students will be required to complete the same foundational core coursework that covers cellular and systems physiology, biophysics, experimental design, data analysis, and a laboratory techniques course. These items are integrated into the following coursework; therefore the program has adopted them as course requirements:

Core Curriculum

- HBY 501 – Physiology (4 credits)
- HBY 530 – Cellular Physiology and Biophysics (3 credits)
- HBY 561 – Statistical Analysis of Physiological Data (1 credit)
- HBY 562 – Model Based Analysis of Physiological Data (1 credit)
- HBY 564 – Experimental Techniques in Systems Physiology (2 credits)
- HBY 570 – Student Journal Club (1 credit, repeated at least 2x)
- HBY 690 – Seminar in Physiology and Biophysics (1 credit, repeated at least 2x)
- GRD 500 – Scientific Integrity (1 credit)

Additional Requirement for 36 Credit Research Thesis

HBY 599 – Master's Thesis Research (6 credits)

Faculty of Physiology and Biophysics Department

Departmental Faculty

Brink, Peter R., Professor Emeritus. Ph.D., 1976, University of Illinois: Physiology and biophysics of functional and excitable membranes.

Cohen, Ira S., Leading Professor, M.D., Ph.D., 1974, New York University: Electrophysiology of the heart; synaptic physiology.

Lin, Richard, Professor, M.D., 1988, University of California: Mechanism of hormone action; Inter- and intracellular regulation of membrane-bound hormone-sensitive enzymes. , PI3 kinase signaling.

Mathias, Richard T. Professor, Ph.D., 1975, University of California, Los Angeles: Electrophysiology of cardiac muscle; volume regulation in the lens.

Miller, W. Todd, Professor, Interim Chairperson Ph.D., 1988, Rockefeller University: Protein structure and function; molecular mechanisms of signal transduction.

Scarлата, Suzanne, Professor, Ph.D., 1984, University of Illinois: Biophysics of signaling proteins.

Solomon, Irene C., Professor., Ph.D., 1994, University of California, Davis: Neural control of respiratory motor output and fast oscillatory rhythms.

White, Thomas W., Professor, Ph.D., 1984, Harvard University: Biology of cell-to-cell communication and gap junction.

Bowen, Mark, Associate Professor, Ph.D., 1998 , , University of Illinois, Chicago; Molecular aspects of signal transduction.

Spector, Ilan, Associate Professor, Ph.D., 1967, University of Paris, France: Electrophysiology of nerve and muscle cell lines; ion channels; neurotoxins.

Acosta, Maricedes, Assistant Professor, Ph.D, 2002, Albert Einstein College of Medicine; Neuroendocrine regulation of the reproductive axis; signal transduction pathways and metabolic control.

Jointly Appointed Faculty

Dilger, James P.⁵, Professor, Ph.D., 1980, Stony Brook University: Neuromuscular junction; ion channels in nerve membranes.

Konopka, James B.¹⁷, Professor, Ph.D., 1985, UCLA: G protein-coupled receptor signal transduction and yeast morphogenesis.

Mendell, Lorne¹, Distinguished Professor, Ph.D., 1965, Massachusetts Institute of Technology: Physiology and modify ability of synapses in the spinal cord.

McKinnon, David¹, Professor, Ph.D., 1987, Australian National University: Control of ion channel expression.

Qin, Yi-Xian¹⁸, Professor, Ph.D., 1997, Stony Brook University: Mechanisms in the control of tissue growth, bone adaptation by mechanical environment.

Reid-Martin, Inefta, Assistant Professor, PhD, 2014, Stony Brook University: characterizing the effects of postnatal maturation on basal respiratory activity and hypoxic ventilatory responses in neonatal rats in vivo

Smith, Steven O.¹⁴, Professor, Ph.D., 1985, University of California, Berkeley: Molecular mechanisms of signal transduction.

Collins, William¹, Associate Professor, Ph.D., 1980, Univ. of Pennsylvania: Relationship between intrinsic properties of individual neurons and nervous system function.

Frame, Mary¹⁸, Associate Professor, Ph.D., 1990, University of Missouri: Microcirculation; tissue engineering; nanofabrication.

Cameron, Roger H., Assistant Professor. Ph.D., 1990, Stony Brook University: Electron microscopy; pharmacology of plasma cells secretion.

El-Maghrabi, Raafat, Associate Professor. Ph.D Graduate Program Director, Ph.D., 1978, Wake Forest University: Enzyme regulation; hormonal control of metabolism.

Luberto, Chiara, Assistant Professor, Ph.D., 1997, Catholic University of Rome: Cancer biology; Sphingolipid metabolism and signaling.

Rosati, Barbara, Assistant Professor. Ph.D., 2000, Milan, Italy: Transcriptional regulation of ion channel genes in the heart.

Valiunas, Virginijus, Assistant Professor. Ph.D., 1992, Kaunas Medical University, Lithuania: Gap junction; intercellular communication and cardiac electrophysiology.

Varadaraj, Kulandaiappan, Assistant Professor. Ph.D., 1991, Madri Kamaraj University: Lens membrane proteins and gap junctions.

Warren, Kelly, Assistant Professor. Ph.D., 2008, Stony Brook University

Yang, Vincent², Professor MD, Ph.D., Rutgers University, Princeton University: Department of Medicine: cloning and characterization of Krüppel-like factors (KLFs)

Khan, Sardar Ali, Professor, M.D., 1964, Bangalore Medical College: Erectile Dysfunction, Pelvic surgery and general urology.

Affiliated Faculty

Colognato, Holly, Ph.D., 1999, Rutgers Univ., Department of Pharmacological Sciences; Extracellular matrix in brain: roles during development and during neurodegeneration.

Frohman, Michael, MD, Ph.D., Univ. of Pennsylvania, School of Medicine, Department of Pharmacological Sciences; Lipid Signalling

Grollman, Arthur P., Distinguished Professor, M.D., 1959, Johns Hopkins University: Department of Pharmacological Science. Chemical carcinogenesis and mutagenesis.

Kritzer, Mary, Ph.D, Yale Univ., Dept. of Neurobiology; Complex functions of the association cortices and the neurobiological basis for their dysfunction in disease.

London, Erwin, Professor, Ph.D., 1979, Cornell University: Department of Biochemistry. Membrane lipid-protein interactions; protein toxin structure and function.

Malbon, C., Leading Professor, Ph.D., 1976, Case Western Reserve University: Department of Pharmacology. Elucidating the genetic basis of developmental and metabolic diseases.

Matthews, Gary, Leading Professor, Ph.D., 1975, University of Pennsylvania: Department of Neurobiology and Behavior. Cellular biophysics of electrical signals in the retina.

Rashba, Eric, Professor, MD, 1992, Yale School of Medicine: Department of Medicine: new mechanisms of QT prolongation and prediction and prevention of sudden cardiac death

Rubin, Clinton, T., Professor, Ph.D., 1983, Bristol University: Department of Orthopaedics. Cellular mechanisms responsible for adaptation in bone.

Sampson, Nicole S., Professor, Ph.D., 1990, University of California Berkeley: Enzyme mechanisms and protein structure-function relationships.

Tonge, Peter J., Professor, Ph.D., 1986, University of Birmingham, England: Department of Chemistry. Enzyme mechanisms in antitubercular drugs and Alzheimer's disease.

Wong, Stanislaus, Assistant Professor, Ph.D., 1999, Harvard University: Department of Chemistry. Fundamental structure correlations in unique nanostructures.

- 1) Joint appointment, Department of Neurobiology
- 2) Joint appointment, Department of Medicine
- 3) Joint appointment, Department of Surgery
- 4) Joint appointment, Department of Pediatrics
- 5) Joint appointment, Department of Anesthesiology
- 6) Joint appointment, Cold Spring Harbor Laboratory
- 7) Joint appointment, Brookhaven National Laboratory
- 8) Joint appointment, Department of Applied Mathematics and Statistics
- 9) Joint appointment, Department of Orthopedics
- 10) Joint appointment, Veterans Administration Hospital
- 11) Joint appointment, North Shore University Hospital
- 12) Joint appointment, Department of Urology
- 13) Joint appointment, SUNY Old Westbury
- 14) Joint appointment, Department of Biochemistry and Cell Biology

- 15) Joint appointment, Department of Biology, University of Tulsa, Oklahoma
- 16) Joint appointment, Department of Pharmacology, College of Physicians and Surgeons, Columbia University
- 17) Joint appointment, Department of Molecular Genetics and Microbiology
- 18) Joint appointment, Department of Biomedical Engineering
- 19) Joint appointment, Department of Pharmacological Sciences

NOTE: The course descriptions for this program can be found in the corresponding program PDF or at COURSE SEARCH.